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10/553,756	10/17/2006	Masaki Okamura	125679	5958

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EXAMINER	
BEHM, HARRY RAYMOND	
ART UNIT	PAPER NUMBER
2838	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/553,756	OKAMURA ET AL.	
	Examiner	Art Unit	
	HARRY BEHM	2838	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 December 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *12-18,20-23,25-28 and 30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *17,18,20-23,25 and 30* is/are allowed.

6)☒ Claim(s) *12-16,26-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments filed 12/29/08 with respect to Claim 12 have been fully considered but they are not persuasive. Applicant argues DeDoncker in view of Deng fail to disclose a conversion device such that an influence of a dead time of said voltage conversion device is removed when a voltage command value of said voltage conversion is at least a power supply voltage and at most a predetermined amount, since Deng does not determine when a voltage command value of said voltage conversion is at least a power supply voltage and at most a predetermined voltage. However, Applicant has not claimed determining when a voltage command value of said voltage conversion is at least a power supply voltage and at most a predetermined voltage. Therefore, the teaching of the reference Deng is not a question of whether the reference determines when a voltage command value of said voltage conversion is at least a power supply voltage and at most a predetermined voltage; rather, it is a question of whether the combined references, when operating in the voltage range would remove the influence of the dead time. Deng teaches removing the effect of the dead time by the technique of narrow pulse elimination. Therefore DeDoncker in view of Deng would have been motivated to remove the influence of the dead time when a voltage command value of said voltage conversion is at least a power supply voltage and at most a predetermined voltage.

Applicant further argues Deng discloses the pulse is not generated when the PWM pulse width is smaller than a predetermined width. However, when a voltage

command is at least a power supply voltage and at most a predetermined voltage, the upper duty cycle would approach unity and the lower duty would approach a predetermined pulse width. Therefore, the influence of the dead time would be removed by increasing the useable pulse width of the upper and not generating the pulse of the lower.

Upon further consideration of Applicant's amendments to claims 17 and 22, the rejections of the amended claims have been withdrawn.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 12, 14 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over De Doncker (US 5,373,195) in view of Deng (US 6,714,424).

With respect to Claim 12, De Doncker discloses a voltage conversion device (Fig. 2) variably changing an input voltage (Fig. 2 +dc link) to be applied to an inverter (Fig. 2 10) driving a motor (Fig. 2 14), comprising: a voltage converter (Fig. 2 20) executing voltage conversion between a power supply (Fig. 2 22) and said inverter; and a control device (Fig. 2 40) controlling a switching duty of an upper arm (Fig. 2 TB1) and a lower arm (Fig. 2 TB2) included in said voltage converter (Fig. 2 20). De Doncker does not disclose the duty cycle as the desired output voltage of the dc link approaches the supply voltage from the battery.

Deng teaches narrow pulse width elimination (Fig. 6) in an inverter to minimize voltage range loss and eliminate the effect of dead-time. It would have been obvious to one of ordinary skill in the art at the time of the invention to provide narrow pulse elimination to the voltage converter (Fig. 2 20) when the desired dc link voltage approaches the input supply voltage from the battery (Fig. 2 22) and the duty cycle of TB2 approaches a narrow pulse width. Therefore the duty cycle of TB2 would be maintained at 0 when a voltage command value of said voltage conversion is at least a power supply voltage (Fig. 2 +dc bat) and at most a predetermined voltage [+dc bat/(1-W_{min}), where W_{min} is the minimum pulse width]. The reason for doing so was “to expand the voltage utilization range for solid-switch power converters with certain DC voltages” (Deng column 3, lines 34-35).

With respect to Claim 14, De Doncker in view of Deng disclose the voltage conversion device according to claim 12, wherein said predetermined voltage [+dc bat/(1-W_{min}) is determined based on the dead time of said voltage converter [W_{min} chose "to reduce the voltage range loss caused by the dead-time" Deng column 5, lines 54-55).

With respect to Claim 16, De Doncker in view of Deng disclose the voltage conversion device according to claim 12, wherein said voltage converter variably changes said input voltage (+dc link) in a linear manner (De Doncker Fig. 3), since the

nonlinear effect of the dead-time is removed when the DC link voltage is near the battery voltage.

Claims 13, 15 and 26-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over DeDoncker (US 5,373,195) in view of Deng (US 6,714,424) and further in view of Kanakubo (US 6,580,253).

With respect to Claim 13, De Doncker in view of Deng disclose the voltage conversion device as set forth above, wherein said control device controls said voltage converter by fixing said switching duty of the lower switch when said voltage command value is at least said power supply voltage and at most said predetermined voltage. De Doncker in view of Deng do not disclose the upper duty cycle must necessarily be fixed. Kanakubo discloses a voltage converter which teaches fixing the duty cycle of the upper to 100% and the lower to 0% when the input voltage approaches the desired output voltage (Fig. 7). It would have been obvious to one of ordinary skill in the art at the time of the invention to fix the duty cycle of the upper and the lower when the desired output voltage approaches the input voltage. The reason for doing so was “reducing the power consumption or enhancing the efficiency” (Kanakubo column 2, lines 58-59).

With respect to Claim 15, De Doncker in view of Deng and Kanakubo disclose the voltage conversion device according to claim 12, wherein in a case where said control device controls said voltage converter to decrease an output voltage (+dc link) of

said voltage converter, said control device fixes said switching duty when said voltage command value reaches a value of at least said power supply voltage (+dc bat) and at most said predetermined voltage (+dc bat/(1-W_{min})).

With respect to Claims 26-28, De Doncker in view of Deng and Kanakubo disclose a voltage converter as set forth above. See claims 14-16, respectively, for additional details.

Allowable Subject Matter

Claims 17-18, 20-23, 25 and 30 are allowed.

The following is an examiner's statement of reasons for allowance: With respect to Claim 17, the prior art does not disclose or suggest, in combination with the limitations of the base claim and any intervening claims, primarily, wherein a control device controlling, said first on-duty to remove an influence of a dead time when said first on-duty calculated based on a voltage command value of the voltage conversion by said voltage converter is influenced by said dead time of said upper arm and said lower arm, wherein said control device controls switching of said upper arm and said lower arm by fixing said first on-duty at said appropriate on-duty, when said first on-duty calculated based on said voltage command value is larger than a maximum effective on-duty and smaller than a longest on-duty allowing said upper arm to be turned on continuously during a control period, and said maximum effective on-duty is determined by dividing an effective control period, calculated by subtracting said dead time from said control period, by said control period.

With respect to Claim 22, the prior art does not disclose or suggest, in combination with the limitations of the base claim and any intervening claims, primarily, wherein a first step of calculating said first on-duty based on a voltage command value of said voltage conversion; a second step of determining whether said calculated first on-duty is influenced by a dead time of said upper arm and said lower arm; a first sub-step of calculating a maximum effective on-duty by using said dead time; a second sub-step of determining if said calculated first on-duty is larger than said maximum effective on-duty and smaller than a longest on-duty and allowing said upper arm to be turned on continuously during a control period based on said determination; a third sub-step of determining if said first on-duty is influenced by said dead time, when said first on-duty is larger than said maximum effective on-duty and smaller than said longest on-duty, and a fourth sub-step of determining if said first on-duty is not influenced by said dead time, when said first on-duty is at most said maximum effective on-duty or equal to said longest on-duty, and said maximum effective on-duty is determined by dividing an effective control period, calculated by subtracting said dead time from said control period, by said control period, and a third step of controlling said first on-duty to be an appropriate on-duty when said first on-duty is influenced by said dead time.

The aforementioned limitations in combination with all remaining limitations of the respective claims are believed to render the aforementioned indicated claim and any dependent claims thereof patentable over the art of record.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably

accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 12 and 14 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 12 and 15 of copending Application No. 11/274,511. Although the conflicting claims are not identical, they are not patentably distinct from each other because such features as a voltage converter controlled by an appropriate duty cycle influenced by a dead-time, a maximum effective on-duty smaller than a longest on-duty is at least a predetermined set value, and setting the on-duty to the longest on-duty are claimed. Furthermore, it would have been obvious to one of ordinary skill in the art at the time of the invention to

stop conversion when a voltage command of said voltage conversion is at least a power supply voltage and smaller than a predetermined voltage and to change a carrier frequency, such as to zero, when a voltage command of said voltage conversion is at least a power supply voltage and smaller than a predetermined voltage.

The following table illustrates the differences between the two sets of claims:

10/553,756	11/274,511	Comment
Claim 12	Claim 1	
A voltage conversion device variably changing an input voltage to be applied to an inverter driving a motor, comprising:	A voltage conversion device variably changing an input voltage to an inverter, the voltage conversion device comprising:	A motor is intended use and it is well known to use an inverter to power a motor.
a voltage converter executing voltage conversion between a power supply and said inverter; and a control device controlling a switching duty of an upper arm and a lower arm included in said voltage converter	a voltage converter including an upper arm and a lower arm and performing voltage conversion between a power supply and said inverter by switching of said upper arm and said lower arm; and	Performing voltage conversion is executing voltage conversion. Switching must have a duty.
so that said switching duty is a duty from which influence of a dead time of said voltage converter is removed,	a control device controlling said voltage converter so as to reduce influence of a dead time of said voltage converter on a duty of said switching,	Obvious to remove influence of dead time by reducing influence of dead time.
when a voltage command value of said voltage conversion is at least a power supply voltage and at most a predetermined voltage.	wherein when a voltage command value of said voltage conversion is larger than a power supply voltage and smaller than a predetermined voltage and said power supply voltage is smaller than a predetermined set value,	Larger than a power supply voltage is at least a power supply voltage. Smaller than a predetermined voltage is at most a predetermined voltage.
	said control device controls said voltage converter by setting said duty to a duty for instructing to stop said voltage	Reference claims additional limitation and was known to stop conversion

	conversion.	
Claim 12	Claim 12	
A voltage conversion device variably changing an input voltage to be applied to an inverter driving a motor, comprising:	A voltage conversion device variably changing an input voltage to an inverter, the voltage conversion device comprising:	A motor is intended use and it is well known to use an inverter to power a motor.
a voltage converter executing voltage conversion between a power supply and said inverter; and a control device controlling a switching duty of an upper arm and a lower arm included in said voltage converter	a voltage converter including an upper arm and a lower arm and performing voltage conversion between a power supply and said inverter by switching of said upper arm and said lower arm; and	Performing voltage conversion is executing voltage conversion. Switching must have a duty.
so that said switching duty is a duty from which influence of a dead time of said voltage converter is removed,	a control device controlling said voltage converter so as to reduce influence of a dead time of said voltage converter on a duty of said switching,	Obvious to remove influence of dead time by reducing influence of dead time.
when a voltage command value of said voltage conversion is at least a power supply voltage and at most a predetermined voltage.	wherein when a voltage command value of said voltage conversion is larger than a power supply voltage and smaller than a predetermined voltage and said power supply voltage is smaller than a predetermined voltage	Larger than a power supply voltage is at least a power supply voltage. Smaller than a predetermined voltage is at most a predetermined voltage.
	Said control device controls sa9id voltage converter by changing a carrier frequency at which switching of said upper and lower arm is controlled	Reference claims additional limitation and was known to change the frequency such as to zero
Claim 14	Claim 15	
The voltage conversion device according to claim 12, wherein said predetermined voltage is determined based on the dead time of said voltage converter.	The voltage conversion device according to claim 12, wherein said predetermined voltage is determined based on the dead time of said voltage converter.	

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to HARRY BEHM whose telephone number is (571)272-8929. The examiner can normally be reached on 7:00 am - 3:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Akm E. Ullah can be reached on (571) 272-2361. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Akm Enayet Ullah/
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